UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,272	04/02/2001	Hyun-doo Shin	Q59549	7285

7590 11/30/2006

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, DC 20037-3213

EXAMINER	
HUNG, YUBIN	
ART UNIT	**PAPER NUMBER**
2624	

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/823,272
Filing Date: April 02, 2001
Appellant(s): SHIN ET AL.

Chid S. Iyer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed October 16, 2006 appealing from the Office action mailed January 20, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,381,605	KOTHURI et al.	4-2002

Wan, X. et al. "A New Approach to Image Retrieval with Hierarchical Color Clustering" IEEE Transactions on Circuits and Systems for Video Technology, Vol. 8, No. 5 [Sept. 1998], pp. 628-643

Weber, R. et al. "A Quantitative Analysis and Performance Study for Similarity-Search Methods in High-Dimensional Spaces" Proceedings of the 24th International Conference on Very Large Data Base [Aug. 1998], pp. 194-205

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 7, 12, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wan et al. ("A New Approach to Image Retrieval with Hierarchical Color Clustering," *IEEE Trans. on Circuits and Systems for Video Technology*, Vol. 8, No. 5, Sep. 1998, pp. 628-643), in view of Kothuri et al. (US 6,381,605).

Regarding claim 1, and similarly claim 7, Wan discloses

(pa-1) partitioning the feature vector data space into a plurality of cells having a uniform size [P. 631, Section B(1). Note that the feature vector space is the color space (colors of the pixels being the feature vectors). Note further that the last three lines of Section B(1) suggests further partitioning of the cells]

Wan does not expressly disclose the following limitations; however, Kothuri et al. teaches/suggests them as indicated below:

(a) determining whether one or more cells from said plurality of cells, on each of which one or more of said plurality of feature vectors are correspondingly concentrated, exist
[Fig. 5, numerals 506, 518; Col. 14, line 55 – Col. 15, line 43. Note that Node Capacity is a predetermined threshold]

(b) hierarchically indexing the feature vector data space when it is determined that said one or more cells, on each of which said one or more of said plurality of feature vectors are correspondingly concentrated, exist in the step (a), wherein, one or more feature vectors are concentrated in a cell when the cell contains more feature vectors than a predetermined threshold.
[Fig. 5, the loop of refs. 506-522; Col. 3, lines 27-37; Col. 14, lines 55-56. Note that the recursive portioning of the feature space (see Fig. 5) inherently defines a tree structure that serves as the hierarchical indexing of the partitioned feature space with each leaf node corresponds to a cell]

Wan and Kothuri are combinable because they have aspects that are from the same field of endeavor of image indexing.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Wan with the teachings Kothuri by hierarchically indexing the feature space if some cells have more feature vectors than a predetermined threshold. The motivation would have been to ensure that each cell contains no more feature vectors than a threshold determined by a parameter of a suitable physical storage device, as Kothuri indicates in column 3, lines 35-38.

Therefore, it would have been obvious to combine Kothuri with Wan to obtain the invention as specified in claim 1.

*****

Regarding claim 3, the combined invention of Wan and Kothuri further discloses

- Constructing a histogram illustrating a number of said plurality of feature vectors in each of a plurality of cells, including said one or more cells
  [Wan: P. 629, Sect. II.A. Note that the color of a pixel is a feature vector and each cell of a partition of the color (i.e., feature) space corresponds to a histogram bin]
- Analyzing a distribution of said plurality of feature vectors using the histogram and determining whether said one or more cells, on each of which said one or more of said plurality of feature vectors are correspondingly concentrated, exist.
  [Kothuri: Fig. 5, numerals 506, 518. Note that each cell, or node, corresponds to a histogram bin]

*****

Regarding claim 12, and similarly claim 13, Kothuri et al. further discloses using nearest neighbor query to conduct search [Col. 19, lines 30-39]. Therefore, claim 12 is rejected per claim 1 and the additional disclosure recited above.

*****

Claims 4-6, 8, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wan et al. ("A New Approach to Image Retrieval with Hierarchical Color Clustering," *IEEE Trans. on Circuits and Systems for Video Technology*, Vol. 8, No. 5, Sep. 1998, pp. 628-643) and Kothuri et al. (US 6,381,605) as applied to claims 1, 3, 7, 12, 13 above, and further in view of Weber et al. ("A Quantitative Analysis and Performance Study for Similarity-Search Methods in High-Dimensional Spaces," *Proceedings of the 24th International Conference on Very Large Data Base*, New York, August 1998, pp. 194-205).

Regarding claim 4, the combined invention of Wan and Kothuri et al. discloses everything except for the following limitations. However, Weber et al. teaches/suggests them as indicated below:

- The indexing method of claim 1, wherein the step (b) comprises the step of indexing the feature vector data space using a vector approximation file
[Section 4.1, lines 1-13]

The combined invention of Wan and Kothuri is combinable with Weber because they have aspects that are from the same field of invention of image indexing.

At the time of the invention, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined invention of Wan and Kothuri by using VA-file for indexing as taught by Weber in order to overcome the indexing difficulty resulted from increased dimensionality of the feature space.

Therefore, it would have been obvious to combine Weber with Wan and Kothuri to obtain the invention as specified in claim 4.

*****

Claims 5 and 6 are similarly analyzed and rejected as per claims 1 and 4 since Kothuri et al. discloses recursive partition of cells in Figure 5 and Weber et al. teaches approximating the data points (i.e., feature vectors) that fall into each cell with the corresponding VA-file in lines 5-8 of Section 4.1.

*****

Claims 8 and 10 are medium claims of claims 4 and 6, respectively, and are therefore similarly analyzed and rejected.

*****

Claim 11 is a medium claim for the combined method of the methods recited in claims 3-6, respectively, and is therefore similarly analyzed and rejected.

(10) Response to Argument

Issue A: Rejection of claims 1, 3, 7, 12, 13 based on Wan et al. in view of Kothuri et al.

Appellant's arguments regarding Issue A are not persuasive. Specifically:

A.1 Appellant argues that Kothuri does not disclose any feature vector space (because) Kothuri is related to indexing of multi-dimensional or multi-attribute data (and) while feature vectors could have more than one dimensions, a general teaching on multi-dimensional data cannot be considered to be a specific disclosure related to a feature vector space where the number of dimensions are significantly higher (P. 11, last paragraph-P.12, 1st paragraph)

Examiner's response:

However, in column 5, lines 29-42 Kothuri et al. disclose the types of multi-dimensional data their invention can be used for, including image feature vectors (line 37). While a high number of dimensions is not a claim limitation, the multi-dimensional data, such as image feature vectors, disclosed in Kothuri can be high, as Appellant indicates in P. 1, last two lines through P. 2, first two lines of the specification. Therefore, the multi-dimensional spaces (to which their respective multi-dimensional data, such as an image feature vector, belongs) of Kothuri are feature vector spaces.

A.2 (Regarding claim 1) Appellant argues that Kothuri follows a completely different approach for hierarchically indexing multi-dimensional data (and) even the individual steps in the hierarchical indexing do not refer to determining cells in which feature vectors are concentrated (P.12, 2nd paragraph and P. 16, 3rd paragraph; see also P. 17,last paragraph)

Examiner's response:

However, regarding hierarchical indexing, claim 1 merely recites

(a) determining whether one or more cells from said plurality of cells, on each of which one or more of said plurality of feature vectors are correspondingly concentrated, exist and
(b) hierarchically indexing the feature vector data space when it is determined that said one or more cells, on each of which said one or more of said plurality of feature vectors are correspondingly concentrated, exist in the step (a), wherein, one or more feature vectors are concentrated in a cell when the cell contains more feature vectors than a predetermined threshold

which Kothuri clearly discloses. [For example, in Fig. 3 of Kothuri the number of data items (e.g., feature vectors) in cell 300 has been determined and since it is greater than a threshold (three in this case, which is the fan out, M, recited in Col. 10, lines 38-39), it is further recursively partitioned into smaller cells until none contains more than the threshold number of feature vectors (i.e., none has feature vectors "concentrated"). Fig. 4 shows the hierarchical structure resulting from the recursive partitioning process, represented as a tree, with each leaf node (420-426) corresponding to one resultant cell and the path from the root node (402) to each leaf node representing the index of that leaf node (i.e., cell).

[See Col. 11, lines 42-49.] Fig. 5, especially the loop formed by refs. 506-522, and Col. 14, line 55-Col. 15, line 43 describe Kothuri's hierarchical indexing approach in detail. Note that the node capacity of Fig. 5, refs. 506 and 518 corresponds to the threshold that determines whether a cell should be further partitioned (i.e., whether it is "concentrated").]

*A.3 Appellant argues that (a) in Appellant's invention, as recited in amended claim 1, the cells (*sic, *should have been the feature vector data space per (pa-1) of amended claim 1) are divided into a plurality of cells having a uniform size regardless of whether they will fit into a particular cell or sub-cell; (b) after that it is determined if cells where a plurality of feature vector space are concentrated exist (by determining if there are more number of cells (*sic, *should have been feature vectors) than a predetermined threshold) and if they exist, then the vector data space is hierarchically indexed and (c) Kothuri does not teach uniform cells but Wan does (P. 15, 3rd paragraph; P. 16, 4th paragraph; see also P. 17,last paragraph)*

Examiner's response:

However, regarding (a), which clearly corresponds to limitation (pa-1) of claim 1 in which the feature vector data space is divided into uniform-sized cells, Wan discloses partitioning a feature space uniformly. [See P. 631, Section B(1) of Wan. Note that the feature vector space in this case is the color space of an image (with the colors, typically represented as 3-dimensional vectors of three

color components, considered as the feature vectors) and quantization corresponds to partitioning since it simply divides each axis, or dimension, uniformly. Moreover, Appellant also admits that Wan discloses uniform partition; see lines 3-5, 4th paragraph on P. 16 of the appeal brief. Note further that in Col. 2, lines 49-56 Kothuri also mentions using colors as multi-dimensional data.]

Regarding (b), it is taught by Kothuri, as discussed in A.2 above.

Regarding (c), note that in the rejection of claims 1, 3, 7, 12 and 13 it is Wan that is relied upon as the primary reference that discloses the use of uniform cell size (as Appellant also admits), not Kothuri. See also the discussion regarding A.3(a) above

A.4 Appellant argues that (a) to combine the teachings of Wan and Kothuri, considerable modification would be required to the respective teachings of Wan and Kothuri; (b) if Wan is modified to have the non-uniform cells as in Kothuri, it will be unsatisfactory for its intended purpose (and) in fact, the last paragraph of page 631 clearly discusses why Wan prefers uniform sizes and (c) Kothuri cannot be modified to have uniform cell sizes; if the cells are uniform, then this technique is not believed to produce its intended result *(P. 17, 2nd paragraph)*

Examiner's response:

Regarding (a), in response to applicant's argument that considerable modification would be required to the respective teachings of Wan and Kothuri, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, as demonstrated in the rejection of claims 1, 3, 7, 12 and 13, the combined teachings of Wan and Kothuri would have suggested to those of ordinary skill in the art would have suggested the claimed invention. Additionally, while ease of modification is not required to establish a prima facie case, since obviously both the uniform quantization (i.e., partitioning) of Wan and the hierarchical indexing of Kothuri (as shown in Fig. 5) can be easily implemented (e.g., in a computer-executable program), it would have been very easy for one of ordinary skill in the art at the time of the invention to combine Wan and Kothuri to obtain the claimed invention.

Regarding (b), note that in the last paragraph of page 631 Wan points out not only when the use of uniform cell size might be advantageous (lines 3-6 of the right column) but also when it is not (e.g., when the color distribution is non-uniform; see lines 1-2 of the right column). In addition, Wan also indicates that retrieval performance generally gets better as the number of quantization bins

(i.e., cells) increases (lines 6-7 of the right column). Therefore, a uniform partition as disclosed by Wan followed by further recursive dividing of cells into more cells of smaller sizes as taught by Kothuri can be expected to improve the retrieval performance (as Wan indicates), as well as to satisfy the hardware constraint (as Kothuri indicates in column 3, lines 32-38; note that as discussed in A.2 above a leaf node corresponds to a cell).

Regarding (c), note that in column 3, lines 5-13 and 32-38 Kothuri states the intended result of being able to efficiently organize multi-dimensional data in a database management system (DBMS) to facilitate rapid retrieval. Such result is achieved by hierarchical indexing the multi-dimensional data (such as feature vectors). Cell partition is an important step in acquiring the indexing [See Fig. 5, ref. 514 of Kothuri] and in Kothuri the partitioning of a cell stops when a condition, namely the limit placed on the number of data items a cell can contain, is satisfied [Fig. 5, refs. 506 & 518]. Clearly cell partition can be non-uniform, as taught by Kothuri, or uniform, as taught by Wan. Therefore, using a uniform cell partition approach can achieve the same intended result and, additionally, at a lower computation cost since Kothuri's partition approach is more computation intensive [see Fig. 5, refs. 508 (compute variance of data items in a cell) & 512 (sort data items)].

A.5 Appellant argues that the Examiner has not satisfied the burden of establishing prima facie obviousness at least because it has not satisfied at least the "all limitations" and "motivation" prongs of the three prong test for obviousness. Specifically, the Examiner has not shown that the combined teachings of Wan and Kathuri suggest the present invention as a whole, including the requirement of determining whether one or more cells from said plurality of cells, on each of which one or more of said plurality of feature vectors are correspondingly concentrated, exist and performing hierarchical indexing on the feature vector data space (P. 18, 2nd paragraph)

Examiner's response:

In response to Appellant's argument that not all limitations are satisfied, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case Appellant is directed to the detailed rejection of claims 1, 3, 7, 12 and 13 (see Section (9) Grounds of Rejections above) in which all limitations have been satisfactorily addressed, including determining the existence of cells in which feature vectors are concentrated and hierarchically indexing those cells. See also the discussion of A.2 above.

In response to Appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Appellant again is directed to the detailed rejection of claims 1, 3, 7, 12 and 13 in which a motivation to combine is clearly stated, namely, "to ensure that each cell contains no more feature vectors than a threshold determined by a parameter of a suitable physical storage device, as Kothuri indicates in column 3, lines 35-38."

Issue B: Rejection of claims 4, 6, 8, 10 and 11 based on Wan et al. in view of Kothuri et al. and Weber et al.

Appellant's arguments regarding Issue B are not persuasive. Specifically:

B.1 Appellant argues that claims 4, 6, 8, 10 and 12 are allowable on the basis of their dependency from independent claims 1 and 7, respectively, which Appellant alleges as allowable (P. 19)

Examiner's response:

Per examiner's response regarding issue 1, Appellant's argument regarding the rejections of claims 1, 3, 7, 12 and 13 is not persuasive. Therefore claims 4, 6, 8, 10 and 12 cannot be allowable on the basis of dependency from allowable claims.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Yubin Hung 11/22/06

Conferees:

Jingge Wu

JINGGE WU
PRIMARY EXAMINER 11/26/06

Bhavesh Mehta

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600